

Section 1: Introduction

1.1 Background and Purpose

This Best Management Practices Manual has been compiled for Williamson County to assist contractors, developers, and various businesses and industries to comply with the guidelines set forth by the National Pollution Discharge Elimination System (NPDES) Phase II Rule.

The fact sheets in this manual are designed for easy reference. They are categorized, focused, and concise to allow easy access and expedient use. Each fact sheet can be used as a stand-alone document that may be distributed to facilitate focused discussion about design and/or implementation of each management practice. Williamson County's BMP fact sheets are categorized in the following manner:

- Contractor Management Practices (WCP): This section presents the BMP fact sheets for the Contractor Management Practices and focuses on practices relating to construction site "Good Housekeeping" measures.
- Temporary Construction Site Management Practices (WTCP): This section presents the BMP fact sheets for the Temporary Construction Site Runoff Management and focuses on practices for Erosion Prevention and Sediment Control.
- Permanent Treatment Practices (WPTP): This section presents the BMP fact sheets for Permanent Storm Water Treatment Controls intended to treat stormwater runoff in the long-term. Unlike many of the other BMP types these can be designed to achieve both stormwater quantity and quality management objectives.
- Post Construction Erosion Prevention and Sediment Control (WPESC): This section presents the BMP fact sheets for Post Construction Erosion Prevention and Sediment Control.

1.2 Stormwater Quality and Quantity

Williamson County's Stormwater Management Regulations, serve as the County's primary stormwater management guideline. This manual is designed to support the Regulations by way of elaborating on various practices, as well as offering specific guidance for selection of BMPs, minimum specifications and requirements, and more complete information about various practices.

Stormwater quantity management involves slowing, detaining, and/or controlling the amount and flow rate of runoff from "major" storm events ranging from a 10 to 500-year statistical storm frequency. Considering the increase in impervious areas due to increased development, an increase in volume places a new emphasis on stormwater quality.

Williamson County is now requiring stormwater quality management techniques be applied to new development and redevelopment in the form of structural and non-structural Best Management Practices (BMPs). Stormwater quality management

involves pollutant control, capture, and /or treatment. Some of the pollutants are referred to as “point sources” and appear in the form of regulated discharges, spills, dumping, illicit connections, etc. This manual primarily focuses on nonpoint source pollution.

1.3 BMP Selections

1.3.1 Define BMP Objectives

BMP objectives must address development and construction as well as existing industry, businesses, and private parties whose activities may contribute to overall water quality. These activities are all unique and require specific knowledge of pollution risks associated with each specific activity. This knowledge is essential in selecting BMPs effectively. Each unique project has specific risks that must be addressed through the BMPs selected for use. In order to reach this goal specific project risks are identified, BMP objectives are developed, and BMPs are selected. The following BMP objectives should be considered:

1. **Practice Good Housekeeping:** Proper management of pollutant sources and modification of construction activities can prevent pollutants from draining or being transported off-site.
2. **Contain Waste:** Dispose of all construction waste in designated areas, and keep stormwater from flowing on to or off of these areas.
3. **Minimize Disturbed Areas:** Land clearing should take place only in areas that will be under active construction within a few months of the time of clearing. Phasing clearing of a large development is recommended. Land clearing during the rainy season should be avoided if at all possible. Sensitive areas such as steep slopes, buffers, and natural watercourse should never be disturbed if at all possible.
4. **Stabilize Disturbed Areas:** Temporary stabilization techniques should be utilized in areas where there are disturbed soils that are not undergoing active construction. Upon final completion of a construction activity, permanent landscaping and stabilization should be applied.
5. **Protect Slopes and Channels:** Steep and unstable slopes should not be disturbed if they are outside of the approved grading plan area. Runoff should be conveyed from the top of the slope in a safe manner ensuring that the slope is stabilized as soon as possible. Natural channels should not be disturbed if at all possible. Temporary and permanent channel crossings require stabilizing as quickly as possible to ensure that increases in runoff velocity caused by the project do not erode the channel.
6. **Control Site Perimeter:** Upstream runoff should be diverted either around or through the construction project in a safe manner. These diversions should be designed to ensure that downstream property would not be damaged. In

addition, all runoff exiting the construction site should be free of excessive sediment, and other pollutants.

7. **Control Internal Erosion:** Sediment laden water should be detained or otherwise treated within the site to avoid potential pollution to external waterways.

Site characteristics and specific contractor activities affect the potential for erosion and pollution by other constituents used on the construction site. While determining BMP objectives site conditions and climatic factors should be considered.

1. Site conditions include the following:
 - Soil type, including underlying soil strata that are likely to be exposed to stormwater.
 - Natural terrain and slope.
 - Final slopes and grades
 - Location of concentrated flows, storm drains, and streams.
 - Existing vegetation and ground cover.
2. Climatic factors include the following:
 - Seasonal rainfall patterns.
 - Appropriate design storm, which takes into account quantity, intensity, and duration of rainfall.
3. Type of Construction activity.
4. Construction schedules, construction sequencing and phasing of construction.
5. Size of construction project and areas to be graded.
6. Location of the construction activity relative to adjacent uses and public improvements.
7. Cost-effectiveness considerations.
8. Types of construction materials and potential pollutants present or that will be brought on-site.
9. Floodplain, Floodway, and buffer requirements.

1.3.2 Determine BMP Categories

Once the BMP objectives are defined, BMP categories must be determined. In order to determine the BMP categories, a plan for the project will be needed. This plan should contain enough detail that draining patterns, topography, existing and permanent stormwater control structures can be located with ease. The plan should identify all of the following information in addition to any requirements set forth by the regulations regarding this matter:

1. Stormwater entrance and exiting locations. Sheet and Channel flow for the existing and final grading contours should be included.
2. Identify locations of steep slopes and unlined channels that are subject to high rates of erosion. Long, steel slopes over 100 feet in length are considered as areas of moderate to high erosion potential. Soil bioengineering is preferred for stabilization over rip rap, and other hard armoring techniques.
3. Categorize slopes as:

Low Erosion Potential (0 to 5 percent slope)

Moderate Erosion Potential (5 to 10 percent slope)

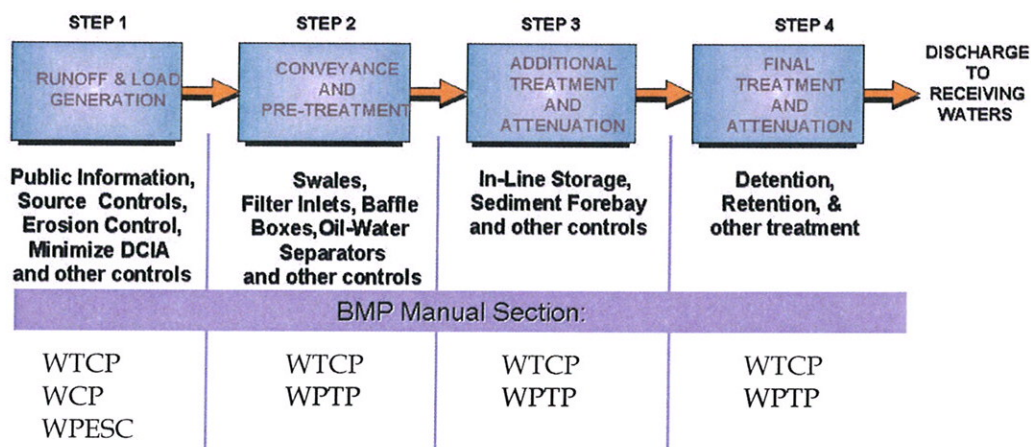
High Erosion Potential (slope greater than 10 percent)
4. Identification of sensitive areas that should not be disturbed such as wetlands, springs, sinkholes, floodplains, floodways, sensitive areas or buffers, including other areas where site improvements will not be constructed. Clearing limits should be identified to prevent and disturbance during construction activities.
5. Identification of tributary areas for each outfall location should be included. The approximate area of each tributary should be calculated.
6. Identification of locations where contractor activities may have a risk of causing a runoff or polluted discharge.

This plan will allow easy identification of BMP categories that need to be considered on a particular construction project. Planning before construction, and phasing construction activities always proves to be more cost effective than treatment of stormwater after the fact. Preventative maintenance is simpler, and less costly, than correcting a problem that has occurred.

Once BMP objectives have been determined, the BMP treatment train illustrated in Figure 1-1 can be utilized. The BMP treatment train is used to determine BMP objectives that will be met by various BMPs. Many BMPs can achieve more than one objective, which should be taken into account when selecting BMPs. This allows for selecting the most cost-effective BMP. For example, it is not always necessary to install extensive sediment trapping controls during construction. In fact, sediment trapping should be used only as a short-term measure for active construction areas, and replaced by permanent stabilization measures as soon as possible. However, it

should be noted that perimeter/outfall control in the form of permanent detention ponds should be built first and used as temporary sediment control during construction. After construction is complete and tributary area is stabilized, the permanent outlet configuration can be reestablished.

Figure 1-1: BMP Treatment Train



1.3.3 Temporary and Permanent BMPs

Temporary BMPs are designed to address construction activities, while permanent BMPs address long-term stormwater management objectives. Planning for both short and long term goals allows for favorable results with respect to cost and performance.

Temporary BMPs include many different “good housekeeping” methods as well as short term EP&SC activities. Permanent BMPs are the final improvements to the configuration of the project. They are designed for long-term management of stormwater pollution. Permanent BMPs are typically selected during the planning phase, in conjunction with the approval of the tentative plan designed during the design phase of a project. On occasion, revision or addition to permanent BMPs during construction may be necessary due to unforeseen natural or manmade factors.

Permanent BMPs may include swales, sediment or detention ponds, and a variety of other features. Licensed professional engineers are responsible for selection of these management practices. These practices should be included in the plans and specifications for the project. In addition, the long-term maintenance responsibilities should be identified per Williamson County Stormwater Management Regulations.

1.3.4 BMP Selection for Construction Activities

Construction activities can result in stormwater runoff pollution if not managed properly. BMPs are used to minimize the potential for stormwater pollution. It is recognized that all BMPs are not effective on every construction site. It is important that all BMPs are considered, and that those which are effective for the project at hand

should be selected. Considerations for selecting BMPs for contractor activities include the following:

1. Is it expected to rain? BMPs may be different on rainy days vs. dry days, winter vs. summer, etc. For instance, a material storage area may be covered with a tarp during the rainy season, but not in the summer. However, it should be noted that plans should be made for some amount of rain even if it is not expected to generate a flooding event.
2. How much material is used? Less intensive BMP implementation may be necessary if a “small” amount of pollutant containing material is used (however, remember that different materials pollute in different amounts).
3. How much water is used? The more water used and wastewater generated, the more likely that pollutants transported by this water will reach the stormwater system or be transported off-site. Washing out one concrete truck on a flat area of the site may be sufficient (as long as the concrete is safely removed later), but a pit should be constructed if a number of trucks will be washed out at the same site.
4. What are the site conditions? BMPs selected will differ depending on whether the activity is conducted on a slope or flat ground, near a stormwater structure or watercourse, etc. Anticipating problems and conducting activities away from certain sensitive areas will reduce the cost and inconvenience of performing BMPs.
5. What about accidents? Pre-establishing a BMP for each conceivable pollutant discharge may be very costly and significantly disrupt construction. As a rule of thumb, establish controls for common (daily or weekly) activities and be prepared to respond quickly to accidents. Define the difference, not everything can be called an accident and maybe classified as negligent disregard of proper practices.

Therefore, keep in mind that the BMPs for contractor activities are suggested practices that may or may not apply in every case. Construction personnel should be instructed to develop additional or alternative BMPs that are more cost-effective for a particular project. The best BMP is a construction work force aware of the pollution potential of their activities and committed to a clean worksite.

1.3.5 BMP Selection for EP & SC Activities

BMPs for erosion and sediment control are selected to meet the BMP objectives based on specific site conditions, construction activities, and cost-effectiveness. Different BMPs may be needed at different times during construction since construction activities are constantly changing site conditions.

EP& SC must begin with the initial prevention of erosion. This can be accomplished through soil protection techniques that will prevent the runoff of soil particles.

Erosion and sedimentation will most probably occur to some degree due to active construction areas, and BMP s must be selected to take care of these issues once they have occurred. Sediment control (SC) BMPs allow sedimentation to be removed from flows before these flows exit the construction site. Consequently, the best protection on active construction sites is generally obtained through simultaneous application of both erosion prevention (EP) BMPs and SC BMPs. This combination is effective because it prevents most erosion before it begins and has the ability to capture sediments that become suspended before the transporting flows leave the construction site.

The following general items are provided to aid in preparing the project plans and choosing appropriate erosion and sediment control BMPs:

Minimize Disturbed Areas - Project layout and schedule should be compared with on-site management measures that where appropriate, can limit the exposure of the project site to erosion and sedimentation. The following BMPs should be considered in order to reach desired goals:

1. Do not disturb any portion of the site unless an improvement is to be constructed there immediately.
2. Staging and timing of construction, grading, clearing, etc. can minimize the size of exposed areas and the length of time the areas are exposed and subject to erosion. For example, only areas that are actively involved in cut and fill operations or are otherwise being graded should be exposed.
3. Retain existing vegetation and ground cover where feasible, especially along watercourses and along the downstream perimeter of the site.
4. The first task when construction begins is to construct outfall detention or perimeter sedimentation controls with weirs/berms, and temporary sedimentation control barriers. Construction of permanent stormwater control facilities such as detention basins should occur towards the beginning of the project and used for sediment trapping, slope stabilization, velocity reduction, etc. during the construction period.
5. Construction should be completed as quickly as possible.
6. Landscaping or other stabilization techniques should be installed immediately after the land has been graded to its final contour.
7. Denuded areas should be at a minimum during the wet months of December through May.

Stabilize Disturbed Areas - Stabilization is very important because it protects the soil from being eroded away. Stabilization techniques may include vegetative, chemical, or physical soil coverings. It is important to keep in mind that any soil which is exposed is subject to erosion due to a rainfall event, runoff flowing over

the soil, wind blowing across that soil, and vehicles driving on the soil. Consequently, it is important that all soil is covered, other than that which is undergoing active construction. Locations on a construction site that are more susceptible to erosion are:

1. Slopes
2. Highly erosive soils
3. Construction entrances
4. Stream channels
5. Soil stockpiles

Site Perimeter – BMPs for regulating flow in and out of the site perimeter should be a priority. The following ideas should be considered:

1. Disturbed areas or slopes that drain toward adjacent properties, storm drain inlets or receiving waters, should be protected with temporary linear barriers (continuous berms, silt fences, sand bags, etc.) to reduce or prevent sediment discharge while construction in the area is active. In addition, the contractor should be prepared to stabilize those soils with EP measures prior to the onset of rain.
2. When grading has been completed, the areas should be protected with EP controls such as mulching, seeding, planting, or emulsifiers. The combination of EP measures and SC measures should remain in place until the area is permanently stabilized.
3. Significant offsite flows (especially concentrated flows) that drain onto disturbed areas or slopes should be controlled through use of continuous berms, earth dikes, drainage swales, and lined ditches that will allow for controlled passage or containment of flows.
4. Concentrated flows that are discharged off of the site should be controlled through outlet protection and velocity dissipation devices in order to prevent erosion of downstream areas.
5. Perimeter controls should be placed everywhere runoff enters or leaves the site. They are usually installed just before clearing, grubbing, and rough grading begin. Perimeter controls for all but the smallest projects will become overloaded by both runoff and sediment. Additional controls within the interior of the construction site should supplement perimeter controls once rough grading is complete.

Internal Swales and Ditches – Until permanent facilities have been constructed flows are directed toward internal swales, curbs, and ditches. Design and implementation criteria should include the following:

1. Temporary stormwater facilities are susceptible to erosion from concentrated flows, and should be stabilized through temporary check dams, geotextile mats, and under extreme erosive conditions by lining with concrete.
2. Long or steep slopes should be terraced at regular intervals in order to slow down the runoff, and to allow for small amounts of sediment to settle out.
3. Slope benches may be constructed with either ditches along them or back-sloped at a gentle angle toward the hill. These benches and ditches intercept runoff before it can reach an erosive velocity and divert it to a stable outlet.
4. A rough surface such as tall grass can be installed to reduce overland flow velocities.

Internal Erosion - After all erosion and sediment control BMPs have been utilized, excessive sediment should be removed from stormwater both within and along the perimeter of the project site. To prevent erosion temporary barriers or traps should slow the velocity of sediment-laden water. This flow should then enter a pond where soil particles may settle. Appropriate strategies for implementing sedimentation controls include:

1. Sediment-laden water should be directed to temporary sediment traps.
2. Locate sediment basins and traps at low points below disturbed areas.
3. Existing and proposed storm drainage structures should be protected from sediment clogging by implementation of inlet protection for area drains and curb inlets.
4. Temporary sediment traps or ponds should be constructed at stormwater outfalls for the site.
5. Stormwater detention ponds should be excavated early in the project so that they can serve as sedimentation ponds during construction, remove accumulated sediment, and landscape the ponds when the upstream drainage area is stabilized.
6. Temporary sediment barriers such as:
 - Continuous Berms
 - Silt Fences
 - Straw Bale Barriers

- Sand Bag Barriers
- Brush or Rock Filter

Stormwater Inlets and Outfalls – All stormwater inlets, including drop inlets, and pipe inlets, should be protected from sediment intrusion if the area draining to the inlet has been disturbed. This protection may include sand bags, sediment traps, or other similar devices. In addition internal outfalls must be protected to reduce scour from high velocity flows leaving pipes or other drainage facilities.

1.3.6 BMP Selection for Structural Treatment Controls

The developer proposes most permanent BMPs during the early planning process of a project. Typically, there is not a single BMP that addresses all long-term stormwater quality problems. This concept is presented in section 1.3.2, which discusses the BMP treatment train.

In most cases permanent BMPs are implemented most effectively when they are tied in with the actual project design. When stormwater controls are considered as part of the design they are conceptually planned out and consequently, more effective. The following should be considered in the design process.

1. Is a detention/retention facility required for flood control? Often, facilities are required to maintain peak runoff at predevelopment levels to reduce downstream conveyance system damage and other costs associated with flooding. Most permanent BMPs can be incorporated into flood control detention/retention facilities with modest design refinements and limited increase in land area and cost. Please refer to Williamson County's Stormwater Management Regulations for the County's detention policy.
2. Planned open spaces that have slopes less than 5% may be merged with stormwater quality/quantity facilities. Such integrated, multi-use areas may achieve several objectives at a modest cost.
3. Infiltration BMPs may serve as groundwater recharge facilities although soil conditions are critical to their success. Detention/retention areas may be created in landscaped areas of the project, and vegetated swales/filters may be used as roadside/median or parking lot median vegetated areas.

1.4 References

California Storm Water Best Management Practice Handbooks, Camp Dresser & McKee et.al. for the California SWQTF, 1993.

Caltrans Storm Water Quality Handbooks, Camp Dresser & McKee et.al. for the California Department of Transportation, 1997.

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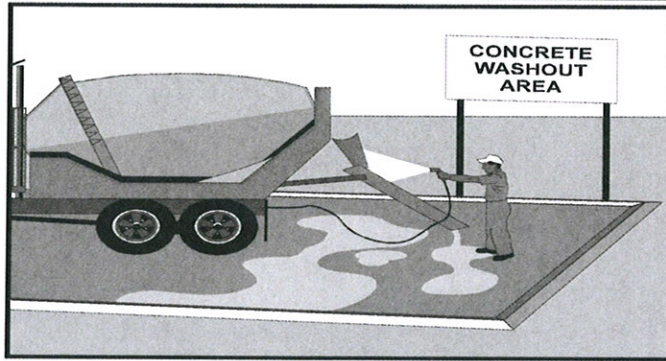
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Storm Water Management for Construction Activities – Developing Pollution Prevention Plans and Best Management Practices, U.S. Environmental Protection Agency, 482N, September 1992.

Users Manual 1.06: Watershed Management Model, Camp Dresser & McKee. For Rouge River National Wet Weather National Demonstration Project for the U.S. Environmental Protection Agency. August 1998.

ACTIVITY: Concrete Waste Management**WCP – 01****Targeted Constituents**

● Significant Benefit

⦿ Partial Benefit

○ Low or Unknown Benefit

○ Sediment

○ Heavy Metals

○ Floatable Materials

○ Oxygen Demanding Substances

○ Nutrients

○ Toxic Materials

○ Oil & Grease

○ Bacteria & Viruses

● Construction Wastes

Implementation Requirements

● High

⦿ Medium

○ Low

○ Capital Costs

○ O & M Costs

⦿ Maintenance

○ Suitability for Slopes >5%

● Training

Description

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout off-site, performing on-site washout in a designated area, and training employees and subcontractors. This management practice is likely to create a partial reduction in construction waste.

Approach

The following steps will help reduce stormwater pollution from concrete wastes:

- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete or cement on-site.
- Perform washout of concrete trucks off site or in designated areas only – such as a specially designed soil mixing sump protected by a sediment trap.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- For on-site washout:
 - locate washout area at least 50 feet (15.2 m) from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste;
 - wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed of properly.
 - be sure the stormwater collection system is protected by means of a sediment trap or similar practice.
- When washing concrete to remove fine particles and expose the aggregate, avoid

creating runoff by draining the water to a bermed or level area.

- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Train employees and subcontractors in proper concrete waste management.
- For a quick reference on disposal alternatives for specific wastes, see the table presented in the Employee/Subcontractor Training BMP fact sheet.
- Illicit dumping on-site or off-site without property owner's knowledge and consent is unacceptable.
- Washout locations may be flagged with lath and surveyors tape or designated as necessary to insure that truck drivers utilize proper areas.

Education

- Instruct drivers and equipment operators on proper disposal and equipment washout practices.
- Educate employees, subcontractors, and suppliers on concrete waste storage and disposal procedures.
- Designate a foreman or supervisor to oversee and enforce concrete waste management procedures. Make supervisors aware of the potential environmental consequences of improperly handled concrete wastes.

Demolition Practices

- Monitor weather and wind direction to ensure concrete dust is not entering storm drains, watercourses, or surface waters.
- Where appropriate, construct sediment traps or other types of sediment detention devices downstream of demolition activities.

Requirements

- Costs (Capital, O&M)
 - All of the above are low cost measures.

Maintenance

- Inspect subcontractors to ensure that concrete wastes are being properly managed.
- If using a temporary pit, dispose hardened concrete on a regular basis that will prevent the pit from being more than half full.
- Foreman and/or construction supervisor shall monitor on site concrete waste storage and disposal procedures at least weekly.

Limitations

- Off-site washout of concrete wastes may not always be possible.

**Primary
References**

California Storm Water Best Management Practice Handbooks, Construction and Industrial Handbooks, CDM et.al. for the California SWQTF, 1993.

Caltrans Storm Water Quality Handbooks, CDM et.al. for the California Department of Transportation, 1997.

**Subordinate
References**

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Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.